Chapter 3.0

Assessment of Issues

Cedar River Watershed District
Watershed Management Plan
Chapter 3: Assessment of Issues

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3.0 Assessment of Issues

The Cedar River Watershed District (CRWD) was recently established on April 25, 2007, and is setting its foundational programs and projects with this plan. The problems that led to the establishment of the CRWD have not been previously addressed adequately. This plan presents the programs and projects the CRWD will implement to correct problems and address issues by priority within the district.

In order to successfully implement the goals, objectives and actions for this plan, the CRWD must use the tools available to it. The CRWD finds the following regarding the resources of the CRWD:

- The CRWD possesses the capacity and legislative authority to fund programs that will promote the policy framework contained within this plan.
- The managers must adopt rules to accomplish the purposes of this plan and to implement the powers of the managers.
- The CRWD is able to leverage its existing authority with grants from outside and private agencies.
- Collaborative efforts are essential with all other units of government in the CRWD to maximize success.

This chapter of the plan presents the issues that present themselves to the new CRWD. The CRWD will use the tools available to it to address problems based on priority and feasibility. In the petition calling for the formation of the CRWD the following problems were noted:

- Increasingly damaging floods over the last 30 years.
- Degradation of water quality and major hydrologic changes subjecting the Cedar River to dangerous flash flooding during or following heavy rainfall events.
- Levels of fecal coliform and total suspended solids above state health standards.
- A coordinated and focused effort to reduce flooding and improve water quality is needed.

The petition also stated the following goals:

- Significant flood and peak flow reduction of 20 percent in the Cedar River and Dobbins Creek.
- Prevention of structural damages in the watershed area during a 100-year 24 hour rainfall event.
- Reduction of sediment loading to watershed streams as a result of reduced flows and corresponding reduction in farmland and riverbank erosion through wetland restoration, buffer installation and erosion control practices.
- Reduction of nutrient loads to all streams in the watershed.
- Protection and improvement of township, county, city and state infrastructure resulting from reduced levels of flooding.

- Protection of the Minnesota Department of Transportation highway system including Trunk Highway 218 and Interstate 90.

The rest of this chapter discusses issues and problems in detail by topic.

3.1 Flood Control Problems and Issues

Impacts from flooding can include damage to structures, utilities and transportation facilities, flood fighting costs, post-flood cleanup costs, business and agricultural losses, increased expenses for normal operating and living during a flood situation, and benefits paid to owners of flood insurance. Other losses that could be suffered during flooding include the loss of life, disruption of normal activities, potential health hazards from contaminated water and food supplies, dislodged fuel storage tanks, and flooding of wastewater collection facilities. Without controls, increased urbanization of a watershed causes an increase in average annual flood damage at a rate approximately proportional to the improvements to existing public facilities, increases in property values, and increases in runoff.

3.1.1 General Flooding Issues

The amount, rate, and type of precipitation are important in determining flood levels and stormwater runoff rates, all of which impact water resources. In urbanized watersheds, shorter duration events tend to play a larger role in predicting high water levels. Shorter duration events are generally used by hydrologists to study local issues (sizing catch basins, storm sewer pipes, etc.). Longer duration events are generally used by hydrologists to study regional issues, such as predicting high water levels and flow rates for streams.

Snowmelt and rainstorms that occur with snowmelt in early spring are significant in this region. The volumes of runoff generated, although they occur over a long period, can have significant impacts where the contributing drainage area to a stream is large.

Average weather imposes little strain on the typical stormwater drainage system. Extremes of precipitation and snowmelt are important for design of flood control systems. The National Weather Service has data on extreme precipitation events that can be used to aid in the design of flood control systems. Extremes of snowmelt most often affect major rivers and the design of large stormwater storage areas, while extremes of precipitation most often affect the design of conveyance facilities.

As noted in Chapter 2.2, climate trends are showing increased precipitation, warmer winters, and increased dew points leading to a higher frequency of large, flashy, intense storms. These flashy storms can overwhelm existing drainage systems. Engineers design drainage systems based on certain events. These design events may be changed in the future to account for climate change and the revision of the Rainfall Frequency Atlas (TP-40) scheduled to be completed in 2011.

The CRWD was formed with flood control as a primary concern. Current Cedar River flood control issues include:

- A need to address existing flooding problems through development and operation of a flood control system, with many homes and businesses remaining in the floodplain that need flood proofing or removal.
- A need to prevent future flooding by managing development and redevelopment throughout the watershed to prevent flooding (e.g. minimum building elevations, land use ordinances).
- A lack of protection for property, surface water systems, and other infrastructure that are often damaged by flood events.
- A need for control of excess stormwater runoff discharge rates and volumes to minimize flood problems, flood damages and the future costs of stormwater management systems.
- A need to bring necessary leadership, cooperation, and assistance to watershed counties and communities.
- A need to consider, operate and coordinate the drainageways and various flow control structures (e.g., roads, culverts, and bridges) as a drainage system.

3.1.2 Specific Flooding Issues

The Cedar River Watershed has experienced an increase in damaging floods over the last 30 years. The watershed has gone through land use changes that include urban development, intensive agricultural practices that lead to accelerated stormwater runoff and increased demands on drainage systems. These changes have resulted in degradation to water quality and major hydrologic changes subjecting the Cedar River to dangerous flash flooding during or following heavy rainfall events. Significant damaging floods have occurred in 1978, 1993, 2000, 2004, and 2008. Flood levels have generally increased over time. The September 2004 flood caused the loss of 2 lives and damages in Freeborn and Mower County were estimated at $17 million in private and public property losses.

Specific flood control issues identified in the CRWD include:

- Significant flooding across the watershed, especially in flat areas.
- Significant flooding occurs during events smaller than the 100 year event (1 percent chance).
- Severe flooding results in damages to buildings, infrastructure (bridges, utilities, roads), and farmsteads.
- Flood damage to buildings and infrastructure (bridges, utilities, roads) has been experienced in Austin, Lansing, Udolpho Townships, and in rural areas north and south of Austin.
- Frequent significant stream bank and stream bed erosion occurs in all reaches of the Cedar River because of high bankfull flows occurring more frequently and for longer duration.

- Expected increased growth and land development pressures and corresponding increases in surface water runoff will require promotion of better stormwater management from a watershed perspective.
- The draining of wetlands has reduced flood storage capacities.
- Often in the past, when roads have been overtopped due to flooding, the culvert sizes have often been increased or a bridge installed. A chain reaction can then be created downstream as flow rates are increased and with water moving faster and faster. This has contributed to the flooding, water quality, natural resource, and wildlife problems in the watershed including:
  - More severe flooding
  - Creek, stream, and river bank erosion
  - Increased sediment loads/TMDL issues
  - Loss of aquatic and upland habitat
  - Damaged roads, lands, and buildings
  - Streams lose base flow/become more dried up as water moves downstream faster, with no chance to infiltrate.
  - Flooding negatively affects aquatic and upland habitat.
- Turtle Creek is a major tributary to the Cedar River that also experiences major flooding. Turtle Creek generally flows through the west and southwest parts of Austin and discharges into the Cedar River just south of Austin. Because Turtle Creek and its watershed come under the jurisdiction of the Turtle Creek Watershed District, the CRWD has no jurisdiction over the Turtle Creek watershed.

Flooding is often accompanied by high organic contaminant levels within rivers. According to the *Water Quality Study of the Cedar River and Tributaries in Mower County*, (Mostrom, 2001), levels of fecal coliform and total suspended solids on the Cedar River in 2000 and 2001 exceeded state health standards. Monitoring is needed to further evaluate the Cedar River and its tributaries under various precipitation and flow conditions and determine the sources of fecal coliform and total suspended solids in the Cedar River.

3.2 Water Quality Problems and Issues

Pollutants are discharged to surface waters as either point sources or non-point sources. Point source pollutants discharge to receiving surface waters at a specific point from a specific identifiable source. Discharges of treated sewage from a wastewater treatment plant or wastewater from an industry are examples of point sources. Unlike point sources, non-point source pollution cannot be traced to a single source (i.e. geographically targeted) or pipe. Instead, pollutants are carried from land to water in stormwater or snowmelt runoff, in seepage through the soil, and in atmospheric transport. All these forms of pollutant movement from land to water make up non-point source pollution. Point sources frequently discharge continuously throughout the year, while non-point sources (with the exception of subsurface sewage treatment systems (SSTS)) discharge in response to precipitation or snowmelt events. SSTS are also known as septic systems and individual sewage treatment systems (ISTS).

For lakes, ponds, and wetlands, phosphorous is often a pollutant of major concern. By definition, point sources of phosphorus typically come from municipal and industrial discharges to surface waters, whereas non-point sources of phosphorus come from urban and agricultural runoff, construction sites, and SSTS.

Nitrates, fecal coliform bacteria, and sediment are also frequently contaminant issues, especially in agricultural areas. Nitrates and sediment are commonly found in agricultural runoff and can also occur in urban stormwater. Fecal coliform bacteria are usually associated with septic systems, feedlot operations, and concentrated wildlife, such as flocks of waterfowl. All of these contaminants can cause impairment of water bodies.

For most water bodies, non-point source runoff, especially stormwater runoff, is a major contributor of pollutants. As urbanization increases and other land use changes occur in the watershed, nutrient and sediment inputs (i.e., loadings) from stormwater runoff can far exceed the natural inputs to the watershed's water resources. Changes to the runoff hydrograph resulting from increased urbanization include higher peak flows, higher runoff volumes, and flashier hydrologic response to precipitation. Changes in the runoff hydrograph may further impact water quality treatment within the watershed (e.g. reduced residence time in sedimentation ponds). In addition to nutrients and sediment, stormwater runoff may contain pollutants such as oil, grease, chemicals, metals, litter, and pathogens, which can severely reduce water quality.

3.2.1 Impaired Waters and TMDL Issues

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect the nation's waters. Water quality standards designate beneficial uses for each water body and establish criteria that must be met within the water body to maintain the water quality necessary to support its designated use(s). Section 303(d) of the CWA requires each state to identify and establish priority rankings for waters that do not meet the water quality standards. The state in turn solicits participation from watershed districts, cities, and counties in pollutant loading or TMDL studies, and in implementing measures to reduce pollution. The list of impaired waters, or 303(d) list, is updated by the state (Minnesota Pollution Control Agency (MPCA)) every two years.

For impaired waterbodies, the CWA requires the development of a total maximum daily load (TMDL). A TMDL is a threshold calculation of the amount of a pollutant that a waterbody can receive and still meet water quality standards. A TMDL establishes the pollutant loading capacity within a waterbody and develops an allocation scheme amongst the various contributors, which include point sources, non-point sources and natural background, as well as a margin of safety. As a part of the allocation scheme a waste load allocation (WLA) is developed to determine allowable pollutant loadings from individual point sources (including loads from storm sewer networks), and a load allocation (LA) establishes allowable pollutant loadings from non-point sources and natural background levels in a waterbody.

3.2.2 Impaired Waters in the Cedar River Watershed District

There are nine (9) stream and river reaches in the CRWD that are listed by the MPCA as impaired for aquatic recreation due to excess levels of fecal coliform bacteria (see Chapter 2.10). These stream and river reaches are covered by the *Revised Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota* (see Chapter 3.2.3).

There are also four (4) reaches of the Cedar River that are listed as impaired for aquatic consumption due to excess levels of PCBs.

Table 2-9 lists the impaired waters within the CRWD, the affected MPCA designated use, the pollutant or stressor that is not meeting the MPCA water quality criteria, and the MPCA target for starting and completing the TMDL process.

There is one additional impaired water body not listed in **Table 2-9** that affects the water quality of the CRWD. Turtle Creek is a major tributary to the Cedar River that discharges into the Cedar River just south of Austin, Minnesota and is impaired for turbidity and fecal coliform (aquatic life). However, as the Turtle Creek Watershed District was formed in 1968, separately from the CRWD, Turtle Creek and its watershed are not under the jurisdiction of the CRWD. Any future Turtle Creek Watershed District TMDL projects will affect water quality in the CRWD. The Cedar River Watershed Turbidity, Excess Nutrient and pH TMDL Study, for example, is currently being undertaken as a joint effort of the CRWD, the Turtle Creek Watershed District (TCWD), and the Shell Rock River Watershed District (SRRWD) (see Chapter 2.10).

3.2.3 TMDL Studies

The federal Clean Water Act (CWA) requires states to develop total maximum daily loads (TMDL) for water bodies that do not meet water quality standards (i.e., impaired water bodies). A separate TMDL must be completed for each listed impairment.

In response to the listing of reaches of the Cedar River for nutrients, turbidity and PH, the MPCA has begun the development of the Cedar River Watershed Turbidity, Excess Nutrient and pH TMDL Study. This study will likely result in implementation tasks that will be required within the watershed and will likely require additions or amendments to this plan (see Chapter 2.10 for more information regarding this TMDL study).

3.2.3.1 TMDL for Fecal Coliform Bacteria in the Lower Mississippi River Basin

The MPCA completed the *Revised Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi*

River Basin in Minnesota in 2006. The study is discussed in Chapter 2.10. The TMDL called for a two-thirds reduction in major sources of fecal coliform — mainly livestock manure and nonconforming SSTS — to meet the federal standard of 200 organisms/100ml of water. The *Lower Mississippi River Basin Fecal Coliform Implementation Plan*, published in February and September 2007, set implementation tasks, such as initiatives for residential unsewered wastewater reduction, feedlot runoff reduction, rotational grazing, and riparian buffers in various locations in the basin.

3.2.3.2 Iowa TMDL for Nitrate in the Cedar River

The *Total Maximum Daily Load for Nitrate Cedar River Linn County, Iowa*, is discussed in Chapter 2.10. The impaired use and subsequent 303(d) listing is for high nitrate concentrations above the EPA's 10 mg/L standard in the drinking water supply for the City of Cedar Rapids. Nitrate in drinking water can cause many problems. It is especially harmful to infants, as excess concentrations may cause methemoglobinemia, or blue baby syndrome, a potentially fatal blood disorder that limits the intake of oxygen and can lead to suffocation (U.S.EPA, 1996). Two sub-basins of the Cedar River in Iowa extend into Minnesota: the Upper Cedar River and the Shell Rock River. In the Iowa TMDL, loading from Minnesota was assumed to be based on the percentage of the watershed in the state, and apportioned by point and nonpoint sources (Iowa DNR, 2006). Although Iowa has no authority in regulating pollution from Minnesota, the TMDL assumed a 35 percent reduction in total nitrate loading from Minnesota. **Table 3-1** shows the existing nitrate-N loads and TMDL reductions for Minnesota:

Table 3-1 Existing Load and TMDL Allocation for Minnesota.

Sub-Basin	Percent in MN	MN Load	TMDL Allocation
Upper Cedar River	42%	5,811 tons N/yr	3,777 tons N/yr
Shell Rock River	18%	1,653 tons N/yr	1,075 tons N/yr

Reductions in nitrate loading to the Cedar River in Minnesota will be important for meeting water quality standards in Iowa.

3.2.4 Turbidity and Sedimentation

Turbidity (cloudiness or opaqueness of water caused by suspended particles) and sedimentation (the deposition of suspended particles) are widespread problems within the CRWD with several stream reaches impaired due to their impacts.

Total suspended solids (TSS) concentrations are estimated using a surrogate parameter called a Nephelometric Turbidity Unit (NTU) to indicate water clarity and quality. High levels of TSS reduce sunlight penetration and affect aquatic life in general. In addition, phosphorus attaches itself to soil particles; therefore, as TSS levels increase, phosphorus concentration increases. Suspended sediment (measured as TSS) may also have a water quantity affect, as the deposition of suspended sediment can alter channel capacity and drainage rates. This can have an effect on water temperatures, flooding, wildlife habitat, dissolved oxygen levels, and many more aspects of the river or stream ecosystem. Reduced channel capacity and its corollary impacts may also result from the deposition of bedload sediments. Bedload sediments are transported along the bottom of the channel, primarily during high flows. There is a statewide water quality standard of 25 NTU, which correlates to a TSS concentration of 45 mg/L.

The report Water *Quality Study of the Cedar River and Tributaries in Mower County* (Mostrom, 2001) examined data collected in the summers of 2000 and 2001 and found that total suspended solids are consistently lower, and transparency is higher, north of Austin than in the Cedar River south of Austin. Turtle Creek had the highest average total suspended solids results in both 2000 and 2001, well above 45mg/L, which correlates to the state standard of 25 NTU. Some causes of turbidity and sedimentation include:

- Urbanization and development
- Agricultural activities
- Natural processes such as erosion, runoff and wind deposition.

Some remedies for turbidity and sedimentation issues include:

- Settlement ponds
- Vegetation buffers
- Construction site erosion control
- Agricultural best practices
- Stabilization of erosion sites
- Wind breaks

3.2.5 Nutrients: Nitrogen & Phosphorus

Total phosphorus and its dissolved form are the “limiting factor” for algae growth and many other types of aquatic vegetation in water bodies. The dissolved form of phosphorus is immediately available for uptake by aquatic vegetation and algae. The nuisance algal blooms can be drastically reduced and/or eliminated by reducing the available phosphorus.

Nitrogen can also increase certain forms of aquatic vegetation. But some types of algae (e.g. cyanobacteria, or blue-green algae) are not affected by nitrogen reduction because an alga of those types fixes its own form of nitrogen. Hence, efforts toward phosphorus reduction are usually a surface water quality priority.

However, because of their impact on groundwater drinking supplies, nitrite and nitrate (NO_2 and NO_3) are a top priority for groundwater protection (see Chapter 3.2.3.2). Since groundwater is recharged by surface water that can carry nitrogen from the surface, it is important to avoid excess nitrogen application in agricultural activities to prevent groundwater contamination.

It is worth noting that in the lower reaches of the Mississippi River nitrogen has become a major concern for the Gulf of Mexico and its aquatic species. This area is currently referred to as the "Dead Zone" due to the very low levels of oxygen there. Since the Cedar River discharges into the Mississippi River, reducing nitrogen concentrations in the Cedar River could help address this problem.

Sources of excess nutrients in surface water include:

- Runoff from urbanization and development, and agricultural activities
- Untreated or inadequately treated wastewater discharge (e.g. failing or noncompliant SSTS, straight-pipe discharge)
- Feedlot operations
- Fertilizers
- Atmospheric deposition

Remedies for excess nutrients in surface waters include:

- Settlement ponds
- Vegetation buffers
- Construction erosion control
- Turf management
- Agricultural best practices
- New or updated wastewater treatment facilities and systems
- Wind breaks
- Public education

3.2.6 Fecal Coliform

The study *Water Quality Study of the Cedar River and Tributaries in Mower County* (Mostrom, 2001) reports that all of the samples taken from the 15 sites in this 2000 and 2001 sampling study found fecal coliform levels above the state standard. The data indicated that fecal coliform levels increased by 60 percent as the river flows south through Mower County.

Some sources of fecal coliform in surface waters include:

- Human waste (e.g. failing or improperly maintained SSTS)

- Untreated or inadequately treated wastewater discharge
- Animal waste
- Overgrazed pastures
- Surface-applied manure
- Feedlots
- Wastes from ducks, geese, deer and other wildlife

Remedies for excess fecal coliform in surface water include:

- New or updated wastewater treatment facilities and systems
- SSTS upgrades
- Settlement ponds
- Agricultural best practices

3.2.7 Mercury

Mercury in Minnesota fish comes almost entirely from atmospheric deposition, with approximately 90 percent originating outside of Minnesota (MPCA, 2004). Because the main source of mercury comes from outside the state and the atmospheric deposition of mercury is relatively uniform across the state, the MPCA has developed a statewide TMDL for mercury of 11 kg/year.

3.2.8 Groundwater

Groundwater and surface water quality are necessarily linked as part of the hydrologic cycle. Especially of concern is the effect of nitrate fertilizers on drinking water supplies. When nitrogen is used for agricultural activities it can be mobilized by precipitation and infiltration, causing contamination to groundwater drinking water supplies.

The City of Austin uses groundwater as its drinking water supply but has not detected nitrite or nitrate (NO_2 or NO_3) in its water.

3.2.9 Water Quality Impacts from Flooding

Along with property damage, flooding can lead to a host of water quality problems due to inundation and high velocity flows. Large flow volumes can lead to stream and river bank erosion, increased sediment loads, loss of aquatic and upland habitat, and mobilization of upland contaminants.

3.2.10 Water Quality Data

Currently, there is a relative lack of consistent and detailed monitoring data for the CRWD. This lack of watershed-wide data makes water quality modeling difficult. Variable land use, practices, geology, stream conditions, and slope mean more data collection is needed to cover the various conditions.

Monitoring is most useful when it occurs consistently through time and is spread throughout the CRWD. Upcoming TMDL studies will provide an opportunity to initiate monitoring and efforts will be needed to continue monitoring even after these studies are complete.

3.2.11 CRWD-Identified Water Quality Issues

The following issues were identified as part of the basis for forming the CRWD:

- Improvements in agricultural operations have helped to reduce erosion and sediment loading but significant problems remain.
- Many segments of the Cedar River and its tributaries are listed as impaired by the MPCA for contamination that includes: turbidity, pH, PCB and fecal coliform.
- Monitoring is needed to further evaluate the Cedar River and its tributaries under various precipitation and flow conditions to determine the sources of fecal coliform and total suspended solids into the Cedar River.
- The abundance and quality of game fish has declined in the CRWD.
- Riparian area development has impacted the water quality of rivers and streams in the CRWD.

3.2.12 Emerging and Future Issues

In response to the listing of reaches of the Cedar River for nutrients, turbidity and pH, the MPCA has begun the development of the Cedar River Watershed Turbidity, Excess Nutrient and pH TMDL Study. This study will undoubtedly result in implementation tasks that will be required within CRWD and will likely require additions or amendments to this Plan. These tasks could include treatment, enforcement, development of rules and/or standards, and construction projects.

It is likely that other waters will be identified by the state as impaired. The CRWD may be required to act on these potential listings too.

3.3 Erosion and Sediment Control Problems and Issues

Sediment is a major contributor to water pollution. Stormwater runoff from streets, parking lots, and other impervious surfaces carries suspended sediment with fine particles of soil, dust and dirt in moving water. Abundant amounts of suspended sediment are carried by stormwater runoff when erosion occurs.

Although erosion and sedimentation are natural processes, they are often accelerated by human activities, especially construction. Prior to construction, the existing vegetation on a site intercepts rainfall and slows down stormwater runoff rates, which allows more time for runoff to infiltrate into the soil. When a construction site is cleared and graded, the vegetation (and its beneficial effects) is removed. Also, natural depressions that provided temporary storage of rainfall are filled and graded, and soils are exposed and compacted resulting in increased erosion, sedimentation and decreased infiltration. As a result, the rate and volume of stormwater runoff from the site increases (*Minnesota Urban Small Sites BMP Manual*, Met Council, 2001). The increased stormwater runoff rates and volumes cause increased soil erosion, which releases significant amounts of sediment that may enter the watershed's water resources.

Agricultural activities can also leave bare soil exposed to precipitation. Agricultural best practices can mitigate the loss of soil, but conventional row cropping leaves the surface exposed to a higher degree than natural conditions. Open tile intakes (e.g. bee-hive or other openings that move unfiltered and untreated field runoff water into pipes) further accelerate sedimentation in downstream water bodies. With the exception of large debris, all field material, including soil, may enter these pipes, especially during storm events. Alternatives to open tile intakes are designed to remove the sediment entering tile drainage systems and may include structural or vegetative BMPs. Regardless of its source, sediment deposition decreases water depth, and degrades water quality, fish and wildlife habitat, and aesthetics. Sediment deposition can also wholly or partially block culverts, manholes, storm sewers, etc., causing flooding. Sediment deposition in detention ponds and wetlands also reduces the storage volume capacity, resulting in higher flood levels and/or reducing the amount of water quality treatment provided. Suspended sediment, carried in water, clouds streams and lakes and disturbs aquatic habitats. Sediment also reduces the oxygen content of water and is a major source of phosphorus, which is frequently bound to the fine particles. Erosion also results in channelization of stormwater flow, increasing the rate of stormwater runoff, and further accelerating erosion.

As erosion and sedimentation increase, stormwater management systems (e.g., ponds, pipes, ditches) require more frequent maintenance, repair, and/or modification to ensure they will function as designed.

Owners and operators of construction sites disturbing one or more acres of land must obtain a NPDES Construction Stormwater Permit from the MPCA. Owners/operators of sites smaller than one acre that are a part of a larger common plan of development or sale that is one acre or more must also obtain permit coverage. The MPCA revised the NPDES Construction Stormwater General Permit; the revised permit went into effect on August 1, 2008. A key permit requirement is the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) with appropriate best management practices (BMPs). The SWPPP must include a combination of narrative and plan sheets that address foreseeable conditions, a description of the construction activity, and address the potential for discharge of sediment and/or other potential pollutants from the site. The SWPPP must include the following elements:

- Temporary erosion prevention and sediment control BMPs
- Permanent erosion prevention and sediment control BMPs
- Permanent stormwater management system
- Pollution prevention management measures

The project's plans and specifications must incorporate the SWPPP before applying for NPDES permit coverage. The permittee must also ensure final stabilization of the site, which includes final stabilization of individual building lots.

3.4 Agricultural and Urban Drainage Systems Problems and Issues

Agricultural and urban drainage systems are necessary for the long-term economic viability of agriculture and commerce within the CRWD. Sustainable agriculture, as well as urban development, relies on these existing drainage systems to allow stormwater to drain the landscape. Public drainage systems, though governed by separate law (see Chapter 2.14.3), can and should be managed in a manner similar to other watercourses.

Agricultural and urban drainage systems are subject to most of the issues described above especially erosion and associated sediment and nutrient discharge to streams. In some cases the management and maintenance of the agricultural and urban drainage systems has not been adequate. Repair or improvement of agricultural ditches in the CRWD needs to include proper control measures to minimize adverse impacts downstream. These measures require effective planning and implementation, and may include re-sloping of banks, providing buffers, and increasing their storage capacity.

Policies that guide the maintenance of the agricultural and urban drainage systems in the CRWD and the assessment of costs are needed. The ditch authority's maintenance program needs to incorporate the use of BMPs such as buffers and sediment ponds. CRWD is not currently the authority for public drainage systems, but may be asked to accept this authority from the counties (per Minnesota Statutes 103D.625). There are many private ditches (which may or may not be Minnesota Department of Natural Resources (MDNR) public waters) that affect the hydrology of the CRWD. There is a need to understand the impacts of all drainage systems, both publicly and privately held, on the hydrology of the CRWD and its impact on pollutant transport.

3.5 Wetland Problems and Issues

Wetland filling and drainage have placed significant pressure on water resource quality and quantity management. Determining the degree of wetland loss in the CRWD is limited by the availability of data. Identifying potential areas for wetland restoration and restoring wetlands as opportunities arise could mitigate the historic loss of wetland areas.

3.6 Groundwater Problems and Issues

The following issues regarding groundwater have been identified within the CRWD:

- The location of groundwater recharge areas in the CRWD have not been mapped or documented in any detail.
- Groundwater is the drinking water source for most citizens of the CRWD and therefore needs protection.

Groundwater, like surface water, varies in quality and quantity and is often more difficult to assess. Due to the porous substrate in the CRWD, the possibility of groundwater contamination is ever present. At the same time, groundwater is the primary source of drinking water in the CRWD and is used for domestic, industrial and agricultural purposes.

Ground water quality is threatened by activities occurring on the land as well as below the land surface such as improperly operating SSTS, nonconforming feedlot operations, and chemical contamination from landfills, storage tanks, spills and other similar activities. The application of fertilizers and chemicals to crops and lawns, the disposal of waste in the soil and construction below the surface in the form of wells, sewers, pits and quarries can also impact the quality of water below the ground surface.

Areas with sandy surface sediments and shallow limestone aquifers are areas with greatest susceptibility. However, most groundwater is susceptible to contamination from improper application of farm and lawn chemicals and fertilizers, feedlot and urban stormwater runoff, and improper disposal of wastewater from SSTS and municipal treatment plants.

Little work has been done in the CRWD to determine which hydrologic units and wells are most vulnerable due to geography or geology, and to develop maps and protection plans. There is a need for this work to occur in the watershed.

There is also a need to promote and provide public education regarding lawn and agricultural fertilizer and chemical use, proper wastewater treatment, and solid waste disposal to reduce chemical and nutrient infiltration to groundwater.

3.7 Land Use Management Issues

Significant changes in the use of land in the CRWD have occurred over the past 100 years. Forest and prairie were predominant in presettlement times. Today, agricultural land uses dominate the landscape. These changes have especially important consequences for streams and lakes, due to the disappearance of natural vegetation which has removed a substantial amount of the natural buffering that previously existed, and has resulted in increased runoff volumes and velocities.

The following issues relating to land use impact water resources in the CRWD:

- Significant alterations of the landscape have occurred over the last 100 years that have dramatically impacted the quality and quantity of water.
- The amount of vegetative buffering that helps to reduce erosion and the transport of sediment and nutrients has been significantly reduced in composition (from trees to shrubs to seasonal grasses) as well as the amount or land area covered.
- The amount of exposed or bare soil conditions through use of the land, from agricultural to mining to land and road construction, dramatically increases the vulnerability of soil erosion and the transport of sediments and nutrients.
- Development has increased surface water runoff and phosphorus loading on CRWD rivers and streams.
- Land use is a matter primarily of local control and local governmental resources are limited.

- The CRWD can provide technical and financial assistance to local units of government to better manage water and land related resource issues.

Agriculture is primary to the social and economic fabric of the CRWD. While it creates jobs, income, and essential products for community livelihood resulting from cultivation and the raising of livestock, it impacts the water resources in the CRWD. Land cover is important to both water quality and quantity in terms of surface water runoff. Each spring and fall, cultivated lands create bare soil conditions, which can erode and runoff into surface water. Finding fair and effective solutions that minimize water resource problems relating to agriculture will challenge the CRWD.

As a part of the MPCA feedlot program, counties have inventoried feedlots and developed databases. This analysis could be utilized to prioritize efforts towards mitigating the impacts of feedlots on water resources in the CRWD.

SSTS serve a large number of households in the CRWD. In general, the higher concentrations of septic systems are found in rural residential neighborhoods, and in the smaller communities in the CRWD that do not presently have a public sewer treatment facility. Detailed data for analyzing the impacts of septic systems on water resources in the CRWD is not readily available. Each county administers an SSTS ordinance and permitting program but the data is typically not site specific or easily convertible to mapping.

Continued inspection of systems and provision of low-interest loans for upgrades could be a priority for targeted areas in the CRWD. Reconstruction, replacement or connection to municipal or common sanitary sewer systems of nonconforming septic systems in these areas should receive the highest priority for funding and technical assistance. New systems in these areas should be inspected by the appropriate local officials.

Within the CRWD there are sand and gravel pits. Aggregate and stone materials produced from these sites has provided a range of products essential for growing communities such as those for road and building construction. Unfortunately, pits and mines are often abandoned and not properly closed. Further, the location and condition of many of these potential abandoned pits and mines is not known. The CRWD should consider developing an inventory of existing mines and abandoned pits. Comparing those sites with a soil sensitivity map would help to prioritize any reclamation and revegetation efforts toward groundwater protection. The impacts that mining can place on water resources, from dewatering to stormwater runoff and erosion, can be significant.

3.8 Public Education

Within the overall watershed context individual actions are important. In order to mobilize the community, water resource education is critical. Currently there are limited and scattered efforts aimed at public education within the CRWD. The creation of the CRWD provides an opportunity to address education and public participation on a watershed scale.

3.9 Funding Problems and Issues

Funding projects and programs is always a challenging task and yet may determine the success of the CRWD's implementation plans. It is the intent of the CRWD Board to utilize funding from as many sources as might be available. Some of these might include:

- grants (federal state and local)
- ad valorem taxing authority
- assessments
- charges/fees ("utility")
- sales taxes
- donations and bequests

Descriptions of these funding sources are located in Chapter 5.1. CRWD can apply for a variety of grants to offset project and program costs. Grant programs change frequently, including amounts, priorities, availability of new grants, and termination of programs. Assessments are often met with public opposition as only properties that drain to and benefit from a certain project are charged. Assessments are also challenging to the watershed district as formulas computing the assessments are complex, notices must be served to all property owners, and property sales produce a steady stream of inquiries regarding the status of unpaid assessments. Ad valorem taxing authority has proved successful for other watershed districts for basic operations and small projects. However state law limits the amount of money that can be collected, excluding large projects from this source. Therefore many watershed districts use charges/fees, similar to other utilities, to pay for projects. In order to charge a fee, an amendment must be prepared to the watershed management plan.